Part of #13

## CLAIMS ANALYSIS

| COPIED CLAIM | CORRESPONDING '164 CLAIM | SUPPORT IN CUMMINS APPLICATION 08/951,754 (EFFECTIVE FILING DATE NOVEMBER 3, 1995) |
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| 21. A heating device for use in an internal combustion engine comprising: | 1 | As described on page 1 lines 4-5, this invention relates to an improved intake air heater assembly for an internal combustion engine. |
| a frame including | 1 | As shown in FIGS. 2 and 3, and discussed on page 8, lines 4-5, intake air heater 10 includes a heater frame member 42. |
| connecting means for attaching said frame to an engine and | 1 | As shown in FIGS. 2 and 3, and discussed on page 8, lines 5-10, heater frame 42 includes a mounting flange portion 46 with mounting apertures 48 corresponding to and positioned for alignment with mounting apertures 36 of cylinder head 16. |
| a recessed body portion having an aperture; | 1 | Heater frame 42 further includes opposed side walls 50, as shown in FIG. 3 and discussed on page 8, lines 14-16, each extending transversely in one direction from the inner edge of frame member 42. Side walls 50 of heater frame 42 each include an access port 74 positioned in alignment with central passage 70 as shown in FIGS 3 and 4 and discussed on page 9, lines 8-9. |
| an electric heating element coupled to said frame; | 1 | As shown in FIG. 3, and described on page 8, lines 20-22, heating element 44 is preferably an electric resistance heater formed from an elongated strip of electrical resistance material. Heating element 44 is electrically isolated from frame 42 except at a ground connection at end of heater frame 42 via a screw 58 as shown in FIG. 3 and discussed on page 8, lines 23-25. |
| a terminal assembly connected to said heating element for conducting an electric current thereto, | 1 | As shown in FIGS. 3 and 4, and as described on page 8, lines 25-26, an opposite end 60 of heating element 44 is connected to an electrical source via an electrical connector 62. |
| said terminal assembly passing through said aperture in said recessed body portion, | 1 | Electrical connector 62 includes a cap screw 76 that extends through an aperture formed in opposite end 60 of heating element 44 and through a central passage 70 of heater frame 42 so as to threadably engage nut 78 as shown in FIG. 4 and discussed on page 9, lines 10-13. |
| said terminal assembly including a first portion connected to said heating element and | 1 | As previously mentioned, electrical connector 62 includes a cap screw 76 that extends through an aperture formed in opposite end 60 of heating element 44. This feature is additionally shown in FIG. 4 and discussed on page 9, lines 10-12. |

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| a second portion removably engageable with said first portion, | 1 | As shown in FIG. 4 and discussed on page 9, lines 25 - page 10, line 6, the electrical connector 62 further includes a threaded rod 90 that extends through a connector aperture 82 formed in the side wall of cylinder head 16 engaging complimentary threads formed on the inner surface of nut 78 which is also threadably coupled to cap screw 76. |
| said second portion being disposable through an opening in the engine for engagement with the first portion of the terminal assembly; and | 1 | As shown in FIG. 4 and discussed on page 9, lines 22 - page 10, line 6, the electrical connector 62 further includes an adaptor plug 84 threadably secured to cylinder block 16 in connector aperture 82. Adaptor plug 84 includes a center passage 86 for receiving a hollow insulating sleeve 88. A threaded rod 90 extends through center passage 86 and hollow insulating sleeve 88 into central bore 80 of nut 78 engaging complimentary threads formed on the inner surface of nut 78 which is also threadably coupled to cap screw 76. |
| grounding means electrically connected to said heating element. | 1 | Heating element 44 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via screw 58 shown in FIG. 3 and discussed on page 8, lines 23-25. |
| 22. The heating device of claim 21 wherein said heating element has a first end and a second end, | 2 | As shown in FIG. 3 and discussed on page 8, lines 20-26, heating element is preferably an electric resistance heater formed from an elongated strip of electrical resistance material. One end of heating element 44 is connected to an electrical source via an electrical connector 62. The other end of heating element 44 is grounded to heater frame 42 via screw 58. |
| wherein said first portion of said terminal assembly is electrically connected to said first end of said heating element and | 2 | As previously mentioned, and as shown in FIG. 3 and discussed on page 8, lines 23-26, one end of heating element 44 is connected to an electrical source via an electrical connector 62. Electrical connector 62 as described on page 9, lines 10-13, includes a cap screw 76 and an elongated nut 78 having a central bore 80. Cap screw 76 extends through an aperture formed in opposite end 60 of heating element 44. |
| wherein said second end of said heating element is electrically connected to said grounding means. | 2 | As shown in FIG. 3 and discussed on page 8, lines 23-25, the other end of heating element 44 is grounded to heater frame 42 via screw 58. |

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| 23. The heating device of claim 22 wherein said first portion of said terminal assembly includes a bolt and | 3 | Electrical connector 62, as discussed in FIG. 4, and described on page 9, line 10, includes a cap screw 76. |
| a union nut cooperating to connect said first end of said heating element to said frame, | 3 | Electrical connector 62, as discussed in FIG. 4, and described on page 9, line 10, includes an elongated nut 78 having a central bore 80 and a cap screw 76. Cap screw 76 extends through an aperture formed in opposite end 60 of heating element 44 and through central passage 70 into central bore 80 so as to threadably engage nut 78. |
| a plurality of insulators arranged to electrically isolate said bolt from said frame, and | 3 | As shown in FIG. 4, and described on page 9, lines 13-20, a set of washers positioned on both sides of vertical wall 68 separate nut 78 and the opposite end 60 of heating element 44 from contacting vertical wall 68 of frame 42. Moreover, cap screw 76 and nut 78 are formed of an electrically conductive material while grommet 72 and at least one of the washers on both sides of wall 68 are formed of an insulating material so as to electrically isolate nut 78, cap screw 76 and opposite end 60 from frame member 42. |
| wherein said second portion of said terminal assembly includes a double ended stud connected to said union nut and a power source. | 3 | As shown in FIG. 4 and discussed on page 9, lines 25 - page 10, line 6, a second portion of the electrical connection includes a threaded rod 90 that extends through a connector aperture 82 formed in the side wall of cylinder head 16 engaging complimentary threads formed on the inner surface of nut 78 which is also threadably coupled to cap screw 76. As a result, an insulated electrical connection is created between opposite end 60 of heating element 44 and the outer end of rod 90 which may then be connected to an electrical source for providing current to heating element 44. |
| 24. The heating device of claim 23 wherein said grounding means includes a grounding strap coupled to said frame by a threaded bolt. | 4 | As shown in FIG. 2, and described on page 8, line 26 - page 9, line 2, heater frame 42 is grounded by a grounding strap 61 connected by a threaded bolt at one end to a tab 63 extending from a mounting flange 46 and at an opposite end to the engine. |

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| 25. The heating device of claim 21 wherein said recessed body portion of said frame includes side walls having an upper edge and a lower portion, and | 5 | Heater frame 42 includes opposed side walls 50, as shown in FIG. 3 and indicated on page 8, lines 14-16, each extending transversely in one direction from the inner edge of frame member 42. |
| wherein said connecting means includes a perimeter mounting member extending substantially perpendicularly from said upper edge of said side walls. | 5 | As shown in FIGS. 2 and 3, and indicated on page 8, lines 5-14, heater frame 42 further includes a mounting flange portion 46 with mounting apertures 48 corresponding to and positioned for alignment with mounting apertures 36 of cylinder head 16. Moreover, mounting flange portion 46 extends perpendicularly from side walls 50 and is positioned generally in a single mounting plane for positioning on the top surface 22 of the cylinder head 16. (See FIGS. 3 and 4 to assess the perpendicular relationship between mounting flange portion 46 and side walls 50). |
| 26. The heating device of claim 25 wherein said connecting means further includes a plurality of mounting bolts and | 6 | As shown in FIG. 2, and as described on page 8, lines 11-12, bolts 51 extend through each aligned set of mounting apertures to secure heater 10 to cylinder head 16. |
| wherein said perimeter mounting member includes a plurality of passages sized to cooperatively engage said mounting bolts whereby said frame is attached to the cylinder head of an internal combustion engine. | 6 | As shown in FIG. 2, and as described on page 8, lines 7-11, flange portion 46 includes mounting apertures 48 corresponding to and positioned for alignment with mounting apertures 36 of cylinder head 16. |

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| 27. The heating device of claim 26 wherein said recessed body portion includes hubs projecting from said side walls to form a C-channel and | 7 | Each side wall 50 as shown in FIG. 3, and as described on page 8, lines 16-20, includes two spaced apart rails 52 extending toward the opposed side wall to form opposed elongated C-shaped mounting grooves 54. (See FIG. 3 to assess the C-shaped nature of mounting grooves 54). Heating element 44 is positioned between side walls 50 in each mounting groove. As described on page 8, lines 23-25, heating element 44 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via a screw 58. |
| wherein said heating device further includes a C-shaped mounting element disposed within said C-channel, | 7 | As shown in FIG. 3, and as described on page 8, lines 19-20, heating element 44 is positioned between side walls 50 in each mounting groove. |
| said C-shaped mounting element having insulating members associated therewith and | 7 | As described on page 8, lines 23-25, heating element 44 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via a screw 58. |
| said insulating members connected to said heating element. | 7 | As previously mentioned, and as described on page 8, lines 23-25, heating element 44 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via a screw 58. |
| 28. A heating device for use in an internal combustion engine comprising: | 10 | As described on page 1 lines 4-5, this invention relates to an improved intake air heater assembly for an internal combustion engine. |
| a parallelpiped shaped frame including side walls having an upper edge and a lower portion, | 10 | As shown in Figures 2 and 3 and as discussed in claim 3 as originally filed, the frame member has a block-like or parallelpiped shape. (See FIGS. 2, 3 and 4 to assess the block-like or parallelpiped shape of the frame member 42). Frame 42 further includes opposed side walls 50, each extending transversely in one direction from the inner edge of frame member 42 as shown in FIG. 3, and described on page 8, lines 14-16. |

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| at least one of said side walls having an aperture formed therein and | 10 | Side walls 50, as shown in FIGS. 3 and 4, and described on page 9, lines 8-9, of frame 42 each include an access port 74 positioned in alignment with central passage 70. |
| a flange connected to an upper edge of the side walls and extending perpendicularly therefrom; | 10 | As shown in FIGS. 2 and 3, and indicated on page 8, lines 5-14, heater frame 42 further includes a mounting flange portion 46 with mounting apertures 48 corresponding to and positioned for alignment with mounting apertures 36 of cylinder head 16. Moreover, flange portion 46 extends perpendicularly from side walls 50 and is positioned generally in a single mounting plane for positioning on the top surface 22 of the cylinder head 16. (See FIGS. 3 and 4 to assess the perpendicular relationship between mounting flange portion 46 and side walls 50). |
| a heating element connected to said frame; | 10 | As shown in FIG. 3, and as indicated on page 8, lines 23-25, heating element 44 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via a screw 58. |
| a terminal assembly including a first portion connected to a first end of the heating element and | 10 | As shown in FIG. 4, and discussed on page 9, lines 10-13, electrical connector 62 includes a cap screw 76 that extends through an aperture formed in heating element 44. |
| a second portion removably engageable with said first portion whereby said heating device may be placed into recessed engagement with a cylinder head and | 10 | As shown in FIG. 4 and discussed on page 9, lines 25 - page 10, line 6, a second portion of the electrical connection includes a threaded rod 90 extending through a connector aperture 82 formed in the side wall of cylinder head 16 engaging complimentary threads formed on the inner surface of nut 78 which is also threadably coupled to cap screw 76. |
| whereby said second portion connects a battery to said first portion through an opening formed in the cylinder head; and | 10 | As shown in FIG. 4 and discussed on page 10, lines 2-5, an insulated electrical connection is created between opposite end 60 of heating element 44 and the outer end of rod 90 which may then be connected to an electrical source for providing current to heating element 44. |

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| grounding means electrically connected to said second end of said heating element. | 10 | Heating element 44, as shown in FIG. 3, and described on page 8, lines 23-25 is electrically isolated from frame 42 except at a ground connection at one end to heater frame 42 via screw 58. |
| 29. The heating device of claim 28 wherein said first portion of said terminal assembly is disposed within an area bounded by said side walls. | 11 | As shown in Figure 4 and indicated on page 9, lines 5-13, electrical connector 62 includes a cap screw 76 that extends through central passage 70 in vertical wall 68, positioned intermediate side walls 50, without extending beyond the boundaries formed by side walls 50. |
| 30. The heating device of claim 29 wherein said frame includes at least one transverse support member connecting said side walls and | 12 | As shown in FIG. 4, and as indicated on page 9, lines 3-8, heater frame 42 further includes upper and lower transverse walls 64 and 66, respectively, extending between side walls 50 at the opposite end 60 of heating element 44. |
| a vertical support member projecting perpendicularly from at least one of said at least one transverse support members and | 12 | As shown in FIG. 4, and as indicated on page 9, lines 5-7, heater frame 42 further includes a vertical wall 68, positioned intermediate side walls 50, that connects upper and lower walls 64, 66. |
| wherein said first portion of said terminal assembly includes a bolt sized to cooperatively engage an opening formed in said vertical support member and threaded to removably engage a first end of a union nut, | 12 | Vertical wall 68 includes a central passage 70 within which an insulating grommet 72 is positioned. Electrical connector 62 includes a cap screw 76 that extends through an aperture formed in opposite end 60 of heating element 44 and through a central passage 70 of heater frame 42 so as to threadably engage nut 78 as shown in FIG. 4 and discussed on page 9, lines 10-13. |

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| a plurality of insulators arranged to electrically isolate said bolt from said vertical support member. | 12 | As further described on page 9, lines 13-20, and as shown in FIG. 4, a set of washers positioned on both sides of vertical wall 68 separate nut 78 and the opposite end 60 of heating element 44 from contacting vertical wall 68 of frame 42. Moreover, cap screw 76 and nut 78 are formed of an electrically conductive material while grommet 72 and at least one of the washers on both sides of wall 68 are formed of an insulating material so as to electrically isolate nut 78, cap screw 76 and opposite end 60 from frame member 42. |
| 31. The heating device of claim 30 wherein said second portion of said terminal assembly includes a double ended stud having a first end coupled to a second end of said union nut and | 13 | As shown in FIG. 4 and indicated on page 9, lines 25 - page 10, line 6, a second portion of the electrical connection includes a threaded rod 90 extending through a connector aperture 82 formed in the side wall of cylinder head 16 engaging complimentary threads formed on the inner surface of nut 78 which is also threadably coupled to cap screw 76. As a result, an insulated electrical connection is created between opposite end 60 of heating element 44 and the outer end of rod 90 which may then be connected to an electrical source for providing current to heating element 44. |
| a second end connected to a power source whereby an electric current is conveyed to said heating element. | 13 | As shown in FIG. 4 and indicated on page 10, lines 2-5, an insulated electrical connection is created between opposite end 60 of heating element 44 and the outer end of rod 90 which may then be connected to an electrical source for providing current to heating element 44. |